Septentrio
Company & Technology

Allsat Open Conference

June 22, 2006

Michael Francois
FP6 Galileo Projects Manager

Septentrio
satellite navigation

Septentrio Company Introduction

Septentrio Technology

Septentrio Products and Applications

Septentrio and Galileo

Working with Septentrio

Company overview

Septentrio
satellite navigation

MISSION

Design, develop & commercialize

Professional GNSS Receivers

Based on the Company's proprietary satellite navigation technology

- Spin-off of IMEC, Europe's premier independent microelectronics R&D center – http://www.imec.be
- Leading European developer of professional GPS/EGNOS and receivers for all Galileo services
- Septentrio: a recognized European center of excellence for complete GNSS receiver manufacturing

Septentrio
satellite navigation

Septentrio Company Introduction

Septentrio Technology

Septentrio Products and Applications

Septentrio and Galileo

Working with Septentrio

Septentrio Technology

Septentrio owns IP and competence for all critical building blocks required for receiver design.

Proprietary Septentrio Technology includes

- Digital baseband on ASICs or flexible FPGA platforms
- Discrete AFE designs and RF ASICs
- Algorithms
  - Tracking algorithms for superior sensitivity
  - Innovative tracking algorithms for Galileo signals
  - Patent pending A Posteriori Multipath Estimator (APME)
  - High precision static positioning, RTK and attitude algorithms
  - RAIM ...

Septentrio
satellite navigation

Septentrio Company Introduction

Septentrio Technology

Septentrio Products & Applications

Septentrio and Galileo

Working with Septentrio

PolaRx – Flexible platform

Septentrio
satellite navigation

- State-of-the-art GPS L1/L2 Receivers
- Fully EGNOS/WAAS capable
- 48 HW channels can be flexibly assigned
- Integration and communication (LINUX, Ethernet, on board logging)

- DGPS/RTK base station / rover
- Single board multi-antenna/heading/attitude
- Expansion board via PCI (for L2C)
- Advanced geodetic features
- Easy to use and accompanied by excellent documentation

PolaRx - High-end Performance

Septentrio satellite navigation

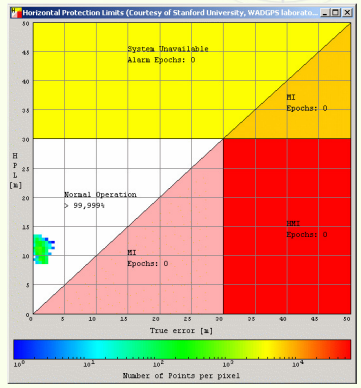
High accuracy positioning (1σ)

- Stand-Alone Position:
  - Horizontal 1.1 m
  - Vertical 1.9 m
- Stand-Alone Velocity:
  - Horizontal 1.5 mm/s
  - Vertical 1.9 mm/s
- SBAS Position:
  - Horizontal 0.7 m
  - Vertical 1.2 m
- RTK
  - Horizontal 0.3 cm + 0.5 ppm
  - Vertical 0.6 cm + 1ppm
  - Avg time to fix (10 km baseline) : 7 sec

PolaRx2/2e Family

Septentrio satellite navigation

- **PolaRx2 SBAS**
  - GPS/EGNOS/WAAS
  - Up to 6 concurrent GEO channels
  - Extensive extra SBAS functionality



- **PolaRx2 OEM**
  - Flexible OEM-card platform for variety of applications

- **PolaRx2@**
  - Compact single board multi-antenna/attitude receiver
  - Raw data, heading and attitude from up to 3 antennas at up to 10 Hz

- **PolaRx2TR**
  - Highly accurate geodetic and Precise Timing receiver
  - Very low measurement noise, high tracking sensitivity, low cycle slip count
  - CORS application : LINUX core, Ethernet connectivity, remote mgt and logging ...

Septentrio
satellite navigation

Septentrio Company Introduction

Septentrio Technology

Septentrio Products and Applications

Septentrio and Galileo

Working with Septentrio

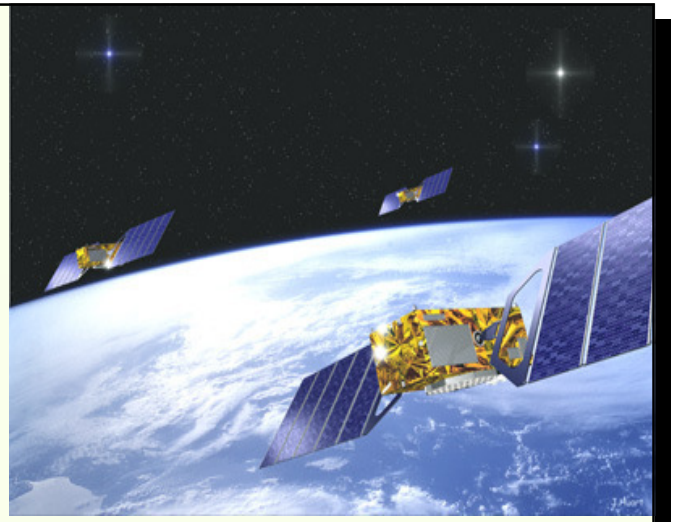
The Case for Galileo

Septentrio satellite navigation

"GPS alone is good enough. Why need Galileo?"...

- Availability
  - One system provides 50% availability
  - Two systems: availability 95% (nominal constellations)
  - More availability essential for every user segment (mass market to professional)
  - Combined receivers will be the standard
- Accuracy
  - Improved accuracy thru better DOP and better signals
- Integrity
  - Built-in new capability which does not exist on GPS
  - You can trust what you read

An exciting Galileo track record



- High-Level Working Group on GNSS-2
  - Early concepts, architecture, funding model…
- Founding Member of Galileo Services
  - Promoting a strategic project in Europe and around the world
- Participating in Galileo Receiver Design since beginning
  - 2001 - Receiver Requirements
  - 2002 - Reference Receiver Design
  - **2004 - Delivered first Galileo receiver model to ESA**
  - **2005 – ESA Contract for Test User Receivers**
  - **2005 - Delivered GSTBv2 receivers, first ever to capture Galileo signal from space**
- **January 12, 2006: first-ever Galileo signals received**
- **Numerous projects for receiver development & testing**

Galileo development activities

Septentrio satellite navigation

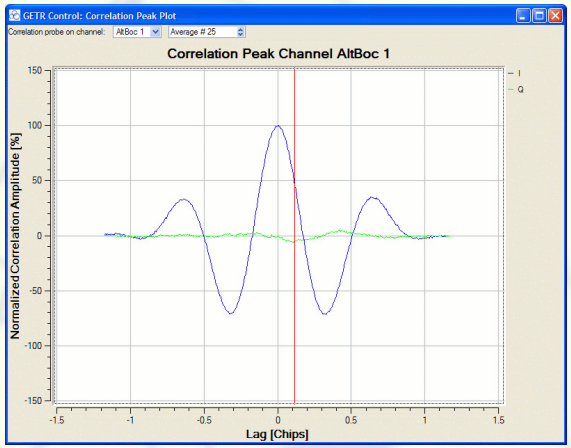
Engineering contracts :

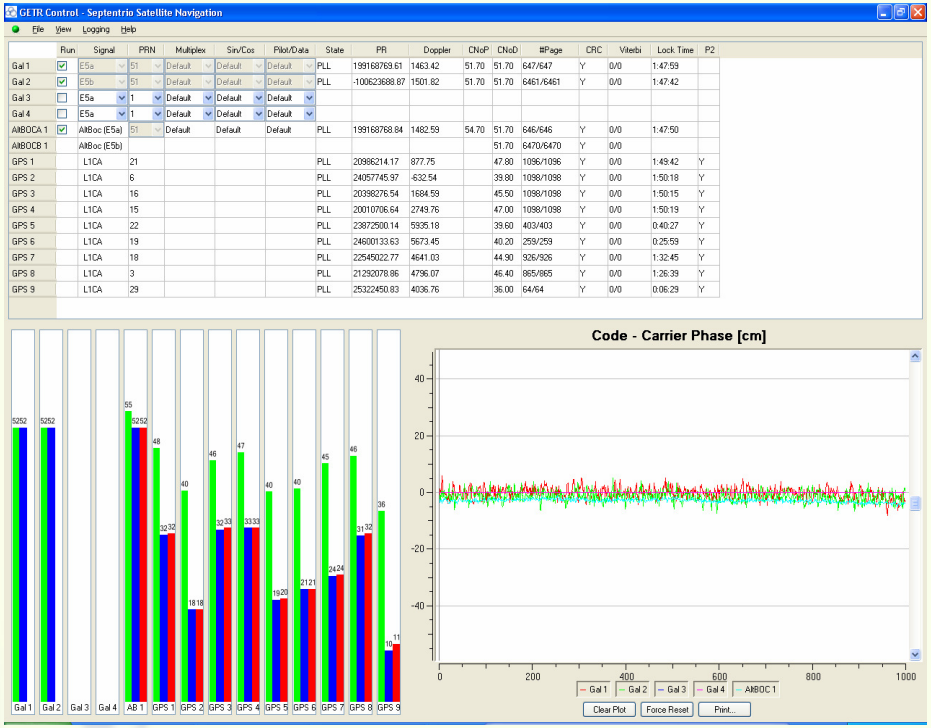
- Prime contractor for ESA Galileo Test User Segment
  - Building and testing receivers for all services
  - Leading a consortium of 7 European companies: QinetiQ (UK), TU Delft (NL), Ursa Minor (NL), OMP (B), Deimos (E), Skysoft (P)
  - Contract till In-Orbit Validation (IOV)
- Septentrio leading and participating in various FP6 Galileo receiver and application projects:
  - Leading Professional Receiver Development (SWIRLS) – with Allsat
  - Participating to Maritime and Aviation application projects
  - http://www.gju-swirls.com

GIOVE-A :
The first ever Galileo signal from space

Septentrio satellite navigation

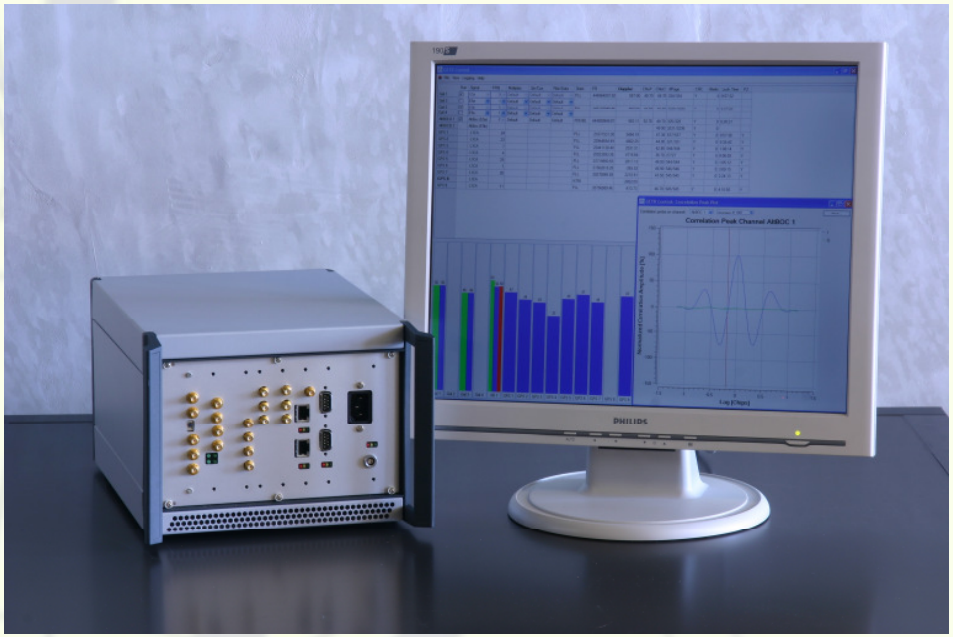
- Satellite successfully launched December 28, 2005
- First signals received on January 12, 2006 with Septentrio Galileo Experimental Test Receiver (GETR)





First commercially available GPS/Galileo Receiver

Septentrio
satellite navigation



- Ready to receive signals from first Galileo satellites (end 2005)
- All Galileo signals supported
- Incl GPS dual-frequency receiver
- Support for GPS L5
- Technology used for testing GSTBv2 satellites
- Includes GUI and advanced user and development tools (incl. IF samples)
- Upgradable to IOV constellation

Introducing
AsteRx1

Septentrio
satellite navigation

High-quality compact single frequency OEM board for high-end applications

- 24 SV, Generic Channel design : GPS L1 CA - Galileo BOC(1,1) – SBAS L1
- Code and carrier phase measurements
- Low measurement noise

- High-quality PVT
- Single-frequency RTK
  - float : 20 cm (horizontal) after convergence
- High update rate (up to 50 Hz) / low latency (< 10 ms independent of update rate)
- Low power < 1W
- 3 COM ports, USB 2.0

Interfaces

- USB 2.0 full-speed device interface
- 3 high-speed COM ports :
  - full RS232 or
  - Rx/Tx LVTTL
- GPIO for
  - 2 event-inputs
  - Programmable PPS-out
  - Tracking/PVT/... Status
  - ...
- All interfaces available via 2 x 40 pins socket (SAMTEC SFM-family)

Easy to integrate

- Dimensions : apx 55 x 75 mm, 28 gr
- 5 VDC ±5% power supply, < 1 W
- Innovative power management :
  - 3 power modes : ON / Sleep (max 2 mW) / OFF
    - Wake-up from sleep :
      - Scheduled wake-up
      - COM-port activity
      - Wake-up pin
- Many configuration possibilities for flexible operation and integration
- Powerful command language, various output formats (binary and Ascii)
- MMCX antenna connector, antenna power supply, protected against short etc

Septentrio
satellite navigation

Septentrio Company Introduction

Septentrio Technology

Septentrio Products and Applications

Septentrio and Galileo

Working with Septentrio

Septentrio
the strategic partner for GNSS business

- GNSS expertise over the full development cycle
  - Unique in Europe
  - Experience in commercial professional receivers and applications
- Unmatched experience and track record in Galileo receiver development:
  - First-ever Galileo signals received with Septentrio receivers
  - Prime Contractor for IOV Test User Segment
  - Coordinator for FP6 Professional Receiver Development
- Flexible and customer-oriented team

Septentrio: your strategic partner for GPS/Galileo receivers

Please visit Septentrio at ION GNSS 2006

Fort Worth, Texas - September, 2006

http://www.ion.org

Ir. Peter A. Grognard – Founder and Managing Director
+32 16 300 800 peter.grognard@septentrio.com

Please visit our website www.septentrio.com